**Tree Statistical Report**

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In this project, we created a Splay Tree and inserted objects called Places, which contained town and state and an ArrayList of zip codes associated with each Place. We then had to search for 500 random places and report on the amount of comparisons that each tree went through in order to find the node.

We then compiled the statistical averages of this data and wrote this report with it.

The average amount of searches for each tree are as follows:

Splay Tree 19.0

AVL Tree 14.0

Binary Search Tree 21.0

The standard deviation for each tree are as follows:

Splay Tree 4.5843

AVL Tree 1.9353

Binary Search Tree 5.9911

To test significance between each of the trees, a two-sample two-tailed t test was performed with an alpha level of .05. Because n for each set is 500, the degrees of freedom is 998. The variance of the two variables was found and square-rooted to find the standard deviation between the groups are as follows.

BST & AVL .28156

BST & Splay .33641

Splay & AVL .22104

To find the t statistic, the difference of the means is divided by the standard deviations above. The following shows the test statistic used to calculate p values for each set.

BST & AVL 24.861

BST & Splay 5.495

Splay & AVL 22.620

Using the t statistic and degrees of freedom, the test is run to find p-values. The p-values are below.

BST & AVL approximately 0

BST & Splay 3.8148 x10^-9

Splay & AVL 1.1784 x10^-91

All of these are <.05, our set alpha level, so it can be concluded that all of the differences in average comparisons between each tree are statistically significant.

**Theoretical Comparison**

Based on theoretical values, each Big-Oh value for the trees was n log(n), but my data points were slightly different than that. Obviously, our data set has something to do with this, but according to theoretical values, there should be no statistically significant difference between these trees, but the AVL tree performed the best by an average of about 5 searches compared to the Binary Search Tree and the Splay Tree.